WE CLAIM:

1. A method of adaptively controlling system stability of an on-frequency repeater, the method comprising steps of:

   generating a signature signal uniquely associated with the repeater;

   inserting the signature signal into a first RF signal transmitted by the repeater;

   detecting a correlation between the signature signal and a second RF signal received by the repeater; and

   controlling an effective radiated power (ERP) of the first RF signal transmitted by the repeater, based on the detected correlation.

2. A method as claimed in claim 1, wherein the step of generating the signature signal comprises steps of:

   generating a unique code signal; and

   shaping the code signal.

3. A method as claimed in claim 2, wherein the step of generating a unique code signal comprises a step of generating a unique sequence of bits.

4. A method as claimed in claim 3, wherein the sequence of bits is spectrally white.

5. A method as claimed in claim 3, wherein the sequence of bits is pre-selected from among a set of orthogonal bit sequences.

6. A method as claimed in claim 2, wherein the step of shaping the code signal comprises a step of modulating the code signal with a predetermined fade signal.

7. A method as claimed in claim 1, wherein the step of inserting the signature signal into a first RF signal comprises a step of modulating a parameter of the first RF signal.

8. A method as claimed in claim 7, wherein the parameter comprises one or more of: a power level and a phase.

9. A method as claimed in claim 7, wherein the step of modulating the parameter of the first RF signal comprises simultaneously modulating the parameter of all RF signals within a predetermined wide-band signal path.

10. A method as claimed in claim 1, wherein the step of detecting a correlation between the signature signal and a second RF signal comprises steps of:

monitoring the second RF signal to detect at least a signal component consistent with the signature signal;

comparing the detected signal component to the signature signal, and generating a correlation signal indicative of a degree of similarity between the detected signal component and the signature signal.

11. A method as claimed in claim 10, wherein the step of monitoring the second RF signal comprises steps of:

sampling the second RF signal;

digitally filtering the sample signal;

comparing the filtered signal to a predetermined threshold; and

generating the signal component based on the comparison result.

12. A method as claimed in claim 10, wherein the step of comparing the detected signal component to the signature signal comprises steps of:

logically comparing respective successive bits of each of the detected signal component and the signature signal; and

averaging the comparison result.

13. A method as claimed in claim 12, wherein the step of logically comparing respective successive bits comprises either one of Exclusive ORing, and ANDing successive bits of each of the detected signal component and the signature signal.

14. A method as claimed in claim 10, wherein the step of comparing the detected signal component to the signature signal comprises steps of:

calculating a cross-correlation of the detected signal component and the signature signal; and

comparing the calculation result to a predetermined threshold.

15. A method as claimed in claim 1, wherein the step of controlling an effective radiated power (ERP) of the first RF signal comprises steps f:

comparing the detected correlation to a predetermined threshold value; and

determining an optimum value of a gain of the repeater using the comparison result.

16. A system for adaptively controlling a system stability of an on-frequency repeater of a wireless communications network, the system comprising:

a signal generator adapted to generate a signature signal uniquely associated with the repeater;

a first modulator adapted to insert the signature signal into a first RF signal transmitted by the repeater;

a detector adapted to detect a correlation between the signature signal and a second RF signal received by the repeater; and

a micro-controller adapted to control an effective radiated power (ERP) of the first RF signal transmitted by the repeater, based on the detected correlation.

17. A system as claimed in claim 16, wherein the signal generator comprises:

a code generator adapted to generate a unique code signal; and

a signal processor adapted to shape the code signal.

18. A system as claimed in claim 17, wherein the code signal comprises a unique sequence of bits.

19. A system as claimed in claim 18, wherein the sequence of bits is spectrally white.

20. A system as claimed in claim 18, wherein the sequence of bits is pre-selected from among a set of orthogonal bit sequences.

21. A system as claimed in claim 17, wherein the signal processor comprises a second modulator adapted to modulate the code signal with a predetermined fade signal.

22. A system as claimed in claim 16, wherein the first modulator is adapted to modulate a parameter of the first RF signal.

23. A system as claimed in claim 22, wherein the parameter comprises one or more of: a power level and a phase.

24. A system as claimed in claim 22, wherein the modulator is adapted to simultaneously modulate the parameter of all RF signals within a predetermined wide-band signal path.

25. A system as claimed in claim 16, wherein the detector comprises:

a monitor adapted to detect at least a signal component of the second RF signal that is consistent with the signature signal; and

a first comparator adapted to compare the detected signal component to the signature signal, and generate a correlation signal indicative of a degree of similarity between the detected signal component and the signature signal.

26. A system as claimed in claim 25, wherein the monitor comprises:

a sampler for sampling the second RF signal;

a filter adapted to digitally filter the sample signal;

a second comparator for comparing the filtered signal to a predetermined threshold, and generate the signal component based on the comparison result.

27. A system as claimed in claim 26, wherein the first comparator comprises:

a first signal processor adapted to logically compare respective successive bits of each of the detected signal component and the signature signal; and

a second signal processor adapted to average the comparison result.

28. A system as claimed in claim 27, wherein the first signal processor comprises either one of an Exclusive OR logic gate, and an AND logic gate.

29. A system as claimed in claim 26, wherein the first comparator comprises a signal processor adapted to calculate a cross-correlation of the detected signal component and the signature signal.

30. A system as claimed in claim 16, wherein the micro-controller is adapted to operate under control of software code to:

compare the detected correlation to a predetermined threshold value; and

determining an optimum value of a gain of the repeater using the comparison result.

31. A method of controlling spatial nulls within an area of overlapping coverage served by at least two transmitters, the method comprising a step of:

generating a signature signal uniquely associated with a selected transmitter; and

modulating a respective RF signal transmitted by the selected transmitter, using the signature signal;

whereby modulation of the RF signal causes a corresponding movement of spatial nulls within the area of overlapping coverage.

32. A method as claimed in claim 31, wherein the step of generating the signature signal comprises a step of generating a unique code signal.

33. A method as claimed in claim 32, wherein the unique code signal comprises a unique sequence of bits.

34. A method as claimed in claim 33, wherein the sequence of bits is spectrally white.

35. A method as claimed in claim 33, wherein the sequence of bits is pre-selected from among a set of predetermined orthogonal bit sequences.

36. A method as claimed in claim 31, wherein the step of modulating a respective RF signal transmitted by the selected transmitter comprises a step of controlling a parameter of the RF signal in accordance with the signature signal.

37. A method as claimed in claim 36, wherein the parameter comprises either one or both of a power level and a signal phase.

38. A method as claimed in claim 36, wherein the a step of controlling the parameter comprises simultaneously controlling the parameter of all RF signals within a predetermined wide-band signal path of the selected transmitter.

39. A system for controlling spatial nulls within an area of overlapping coverage served by at least two transmitters, the method comprising a step of:

a signal generator adapted to generate a signature signal uniquely associated with a selected transmitter; and

a modulator adapted to modulate a respective RF signal transmitted by the selected transmitter, using the signature signal;

whereby modulation of the RF signal causes a corresponding movement of spatial nulls within the area of overlapping coverage.

40. A system as claimed in claim 39, wherein the signature signal is derived from a unique code signal.

41. A system as claimed in claim 40, wherein the unique code signal comprises a unique sequence of bits.

42. A system as claimed in claim 41, wherein the sequence of bits is spectrally white.

43. A system as claimed in claim 41, wherein the sequence of bits is pre-selected from among a set of predetermined orthogonal bit sequences.

44. A system as claimed in claim 39, wherein the modulator is adapted to control a parameter of the RF signal in accordance with the signature signal.

45. A system as claimed in claim 44, wherein the parameter comprises either one or both of a power level and a signal phase.

46. A system as claimed in claim 44, wherein the modulator is adapted to simultaneously control the parameter of all RF signals within a predetermined wide-band signal path of the selected transmitter.